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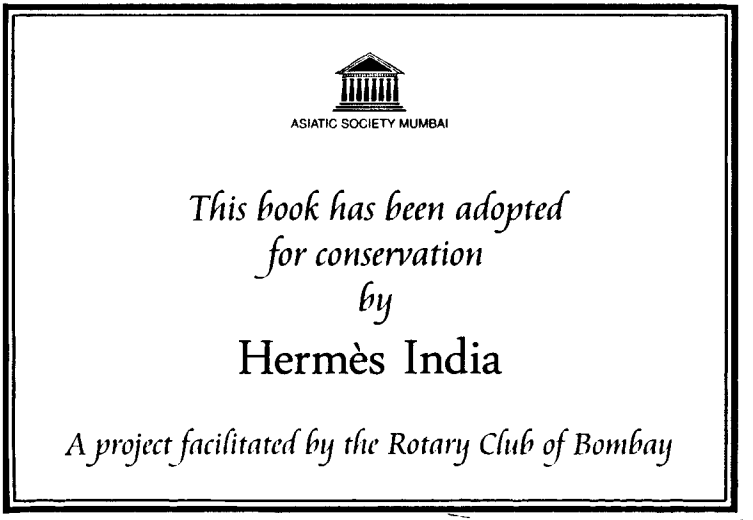

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A PRIMER OF ART.

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BY

JOHN COLLIER.

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PREFACE.

THIS little work is addressed to all those who are endeavouring to learn the Arts of Design, in the hope that it may remove some practical difficulties from their path, and at the same time give them some insight into the principles that underlie these difficulties. I have confined myself chiefly to those points that admit of clear and definite treatment; even where I have touched upon debatable points, they have been such as the progress of inquiry may be reasonably expected to render less doubtful from year to year.

The illustrations of prehistoric drawing and sculpture I have drawn myself from casts in the British Museum; the other illustrations are mostly borrowed.

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A PRIMER OF ART.

DEFINITION OF ART.

ART is a word of very wide significance, and extremely difficult of definition; speaking broadly, art is a creative operation of the intelligence, it is the making of something either with a view to utility or pleasure—so that it falls naturally into two great divisions, each of which corresponds with one of these different ends, namely, the Useful Arts and the Fine Arts. By modern and perhaps incorrect usage the word is gradually getting confined to the latter division.

Although it is quite correct to speak of the arts of weaving, husbandry, &c., yet when "the Arts" are mentioned without any qualification the term is understood as referring to the fine arts, *i.e.* music, the drama, painting and sculpture, whilst the word Artist is usually applied only to those who are concerned with the last two of these pursuits.

It is with this narrowest meaning of the word that we are here concerned. The subject of this primer is the so-called arts of design, painting and sculpture, including decorative art.

In this narrower sense, art may be defined as the making of something to please the eye. It must

be confessed that this definition leaves much to be desired, for it certainly includes one side of architecture, which is quite beyond our present subject, and perhaps excludes some very fine works of painting and sculpture which may stir the emotions but can scarcely be said to *please* the eye. But it will be sufficient, as indicating the general nature of our subject matter.

The question how far the last objection to our definition is valid raises rather a nice point. It may be held that the object of all fine art is to give pleasure, either directly, by exciting those sensations that are in themselves pleasurable, or indirectly, by stirring the emotions. I consider myself that the point is rather too fine to be profitably discussed here, so we will pass on to the origin of art.

The love of beauty appears to be one of those deep-rooted emotions for the origin of which we must go much further back than the fullest extent of man's history. It is certain that many of the lower animals possess it. The most unequivocal instance of this is to be found in the habits of the Bower-birds of Australia, who decorate the bowers, from which they derive their name, with feathers, shells, cones, leaves, and any little bits of finery that they can pick up. It is also highly probable that the varied plumage of birds and the rich markings of beasts owe their origin to the sense of beauty which causes richly coloured mates to be preferred to those of a more dingy hue.

So we may well assume that primitive man, long before he had developed any trace of art, was capable of taking delight in the beauty of his fellows or of the animate and inanimate nature that surrounded him; but from this to the making of beautiful things was a

very long step. How was the step first taken? Of course, in the present state of our knowledge, we can only hazard the merest conjecture as to the beginnings of civilisation; but what little we do know seems to point to some such origin as this for the arts of design.

The earliest known remains of man have been found preserved in caves, chiefly in England, France, and Belgium. They belong to what is called the palæolithic, or old stone age, a period which, although comparatively late in a geological sense, is nevertheless of such remoteness that when one thinks of it the most ancient historical records seem but the chronicle of yesterday.

Man was then living in a state of the utmost savagery. His tools and weapons were made of roughly chipped flints, and of fragments of bone and horn; the use of carefully-shaped and polished flints belongs to an altogether later epoch, which was in its turn succeeded by the ages of bronze and iron. In the early stone age man dwelt in caves, and was apparently ignorant of husbandry, spinning, or pottery, nor had he yet learned to domesticate animals—all which advances in civilisation belong to the subsequent neolithic period. He was surrounded by wild animals, many of which, such as the lion, hyæna, hippopotamus, bear, and reindeer, have long ceased to inhabit the countries where these remains are found; and others, such as the mammoth, the woolly rhinoceros, the cave bear, and the cave lion are now altogether extinct, a fact which in itself marks the extreme remoteness of the age.

Yet in this primitive savage, belonging as it were to a different world from ours, the germs of art were already developed. We find scratched on these

fragments of bone and horn, representations of animals which, however rude, are yet very spirited, and so faithful that there is no difficulty in recognising the different types for which they are intended.

The figures in these drawings are sometimes single, sometimes in groups; amongst other animals have been recognised the seal, ox, ibex, red-deer, great Irish elk, bison, horse, and mammoth. There is even one unmistakable figure of a man, grouped with two

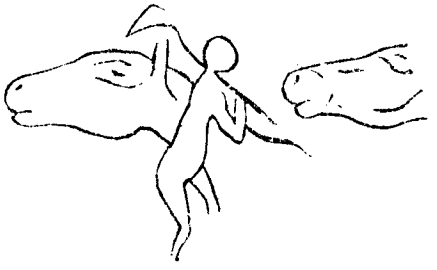

FIG. 1.—Prehistoric drawing. Man with two Horses' heads.

horses' heads, which was found in a cave at La Madeleine in the Dordogne. On the reverse side of the bone are two well-executed heads of bisons (Figs. 1 and 2). It will be seen that these sketches, although very slight, show no trace of any conventionality of treatment; they are probably as like the objects as an unpractised hand could make them with the rude materials at its disposal.

It would seem that we have here the common origin of two of the most important factors of civilisation.

The drawings served two purposes. In the first place

they conveyed an idea from one man to another without the aid of speech. This was the germ of writing. The letters now in use are the lineal descendants of hieroglyphics, and these again are but simplified forms of actual pictures of the objects and events of nature. In the second place they pleased the eye. They were representations of objects that aroused

FIG. 2.—Prehistoric drawing. Head of Bison.

man's sense of beauty and so came to be regarded as beautiful in themselves. They were then reproduced, without regard to the original, until the picture became conventionalised into a pattern, which pattern, once freed from the trammels of nature, developed itself according to man's sense of harmony of line and colour.

This then was the origin of decorative art.

ORNAMENT.

This may appear a mere fanciful sketch of the development of ornament, but it can be supported by a reference to known facts. Indeed there are many instances in which this development can be clearly traced. The ethnographical collection of General

FIG. 3.—Series of paddles. (After General Pitt-Rivers.)

Pitt-Rivers, F.R.S., which has been for some time on view at South Kensington, gives many interesting examples of the development of ornament. Amongst others there is a series of paddles which give a number of intermediate steps between a well-defined human face, and a mere conventional ornament like a crescent into which the face eventually grows (Fig. 3). A similar process of what may be called degradation is exemplified in a work by Mr. John Evans, F.R.S., on the coins of the ancient Britons. Fig. 4 shows how the gold "stater" of Philip of Macedon,

FIG. 4.—Series of Coins.

the prototype of the British series, was so crudely imitated by native copyists that at last only the wreath survived, which was sometimes arranged in the form of a cross.

Any natural object could give the starting-point for a pattern which would soon lose all resemblance to the thing it originally represented, and of which the changes would be merely controlled by that mysterious law of harmony which probably has its origin in associations of pleasing ideas, and partly perhaps in the actual structure of the eye, but which is too little understood to be more than alluded to here.

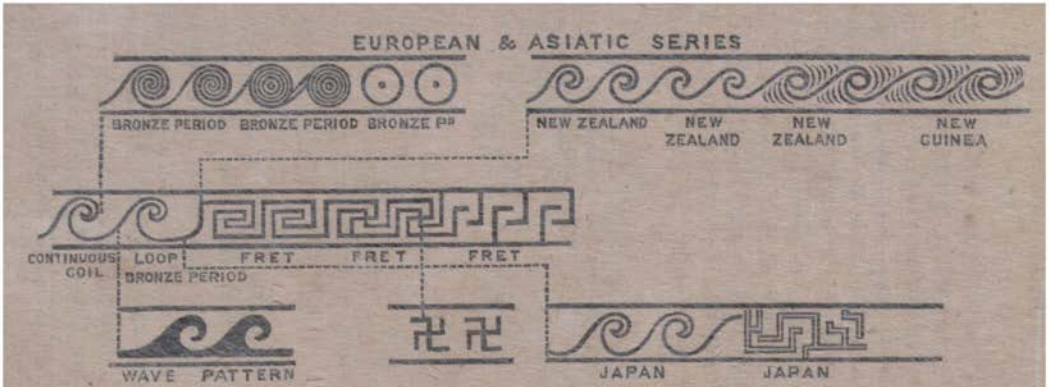

FIG. 5.—Variations of the Greek fret. (After General Pitt-Rivers.)

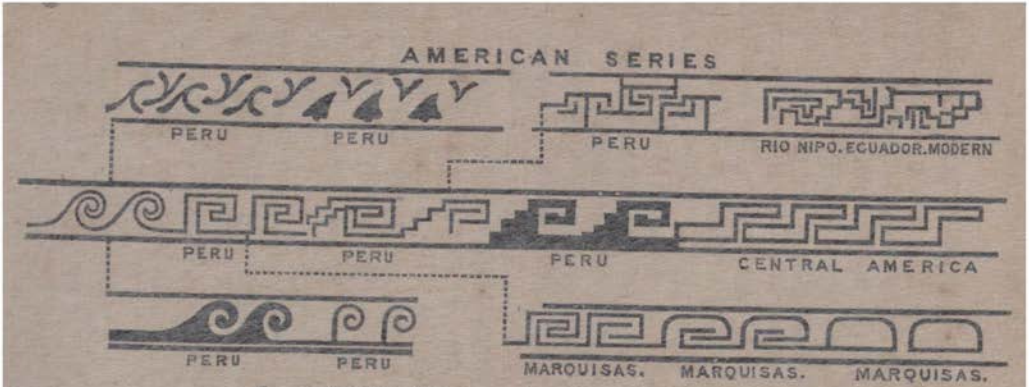

FIG. 6.—Variations of the Greek fret. (After General Pitt-Rivers.)

The well-known Greek fret, variations of which are spread over the whole inhabited earth, has been traced back by General Pitt-Rivers to a double loop, a form assumed by the tendrils of many plants, or which might accidentally occur in any piece of fibre or sinew used by man (Figs. 5 and 6). It is, however, curious to remark that there is some evidence of this pattern having been developed by the Peruvians from the representation of a human face, and, indeed, in a process of simplification, like the one we are considering, there is no reason to doubt that the same pattern might be arrived at independently by different tribes and even from different sources.

The origin of decorative art is therefore to be found in the imitation of nature, and it is probable that all ornaments, no matter how conventionalised, could, with adequate knowledge, be traced back by a series of minute modifications to some natural object.

It may be as well to examine this process of modification a little more closely. Let us take some simple object, such as an oak leaf. It is quite possible to make a painting of an oak-leaf that at a little distance shall deceive the eye. That is, the leaf and the painting produce the same visual impressions. This is simple imitative art. The eye, however, will not be deceived if the general form and colour of the leaf be preserved, but its infinite variety of tone entirely neglected. The painting will be like an oak-leaf but it will lack some of its visual qualities. The process of abstraction has begun. Further, the form of the leaf with its light and shade can be accurately given, but the colour rendered by black and white or some other colours not its own. Then the simplification can

proceed by leaving out the light and shade, and merely giving the correct form of the outline. So far the representation of the object is still recognisable, but there is no need to stop here, the characteristic indentations can be left out, leaving the outline a simple oval; here the leaf is becoming a pattern. Then the oval can change into a circle and this again into a polygon and so into any possible geometrical figure which again can combine with others into any possible pattern, all resemblance to the original having long completely disappeared. And, indeed, if any new ornamentation is wanted this is the way to set about inventing it, namely, to choose some natural object, then to simplify it until it can readily be dealt with by the materials at one's disposal, and with reference to the space it has to fill.

As we hear a great deal about decorative art nowadays, it may be as well to inquire if there are any great principles of decoration. Is there any rule to which it must conform? There is only one—it must be beautiful, it is subject to no other law. Beauty is that which pleases the eye. If ornament is pleasing it is good, if not it is bad. As to what is pleasing, that each person must decide for himself.

It must be observed that this statement is strictly confined to decoration. In most pictures and statues there are many other qualities besides the decorative ones, and these, of course, must be judged by very different considerations.

As a rule there is a considerable uniformity of opinion with regard to what is beautiful and what is not, a consensus that is probably chiefly caused by the deep-rooted nature of the feeling itself.

This leads us to consider if any rules can be framed to assist the decorative artist in his endeavour to please. Here again the answer is simple. Undoubtedly the most pleasing forms are those of natural objects. No one affects to deny the extreme beauty of flowers, of plants of all kinds, of birds, beasts, and fishes, and especially of men and women, if one takes the trouble to select favourable specimens. Then there is the veining of minerals, the forms of crystals, the glitter of spray, the colours of the rainbow, to take instances at random out of the vast field of natural beauty. The mine is inexhaustible; the artist has but to dig; and supposing his materials are too rude to admit of an accurate imitation of nature the process of simplification is easy. He must not infringe the law of harmony which exists in his brain as in that of his fellow men. If he is one of those unfortunate persons in whom the sense of this law is defective he has no business to be an artist at all. And this process of simplification must after all be regarded as a necessary evil not in any way as an improvement. The real object is much more beautiful than the conventional representation.

When this last truth was once recognised there came a striving after a complete representation of nature. At first the coarseness of the tools and materials stood in the way. As we saw, the first known works of art were scratched on a piece of bone with a flint knife. Not even Titian could have produced any very adequate representation of nature with such means.

SCULPTURE.

We find in those earliest of artistic remains of which I have already spoken, not only drawings on the flat, but also—though more rarely—what may be called sculptures in the round (Fig. 7). The mere question of convenience seems chiefly to have determined which form was used; if there was a rounded bone which could easily be turned into a complete figure, a sculpture was the result; on a more or less flat surface a drawing was made. It is not indeed unlikely that accident gave the first idea of art; a piece of bone looked like the form of some well-known animal; to increase this resemblance was a very simple matter, and this

FIG. 7.—Prehistoric sculpture. Reindeer.

would gradually lead to the carving of any piece of bone that had anything like the shape of a natural object. For this reason I think it probable that sculpture was the earliest of the two forms, although there is no direct evidence on the point. Indeed, if one wants to make something like a natural object, the obvious way is to make it of the same shape. The incised lines by which the smaller details on the

sculpture were made out would soon suggest that the whole representation could be given by means of similar lines on a flat surface.

Are then the masterpieces of Greek sculpture—works that represent the highest point to which art has ever attained—are these the lineal descendants of the little pieces of roughly carved bone that we find in the caves of the Pyrenees?

I have no hesitation in answering the question in the affirmative. It is true the progress has been great, but then, even on a low estimate, there has been some fifty thousand years to make it in.

It is possible, however, that a very artificial form, such as the bas-relief, may be rather a modification of drawing than a development from that sculpture in the round which I am inclined to think was the beginning of all artistic representation.

We will suppose a drawing scratched on a mud wall. If the scratches were deepened for the sake of vigour, and then rounded off towards the inside, we should obtain the low modelling that is found in the Assyrian reliefs. If the clay all round the figure were scraped down to the depth of the incision, so as to get a flat, depressed ground, we should have the bas-relief of the Greeks. The desire to obtain additional vigour and modelling would make the relief bolder and bolder, until we reached the alto-relievo, with its undercut outline and highly projecting details. Some such process as this has been assumed by a writer of great ability to be the origin of all sculpture; the wholly detached figure being only a further development of the alto-relievo. This theory, however ingenious, is certainly inconsistent with the fact that wholly

detached figures are amongst the earliest remains of all art, far earlier than any trace of bas-relief.

No doubt the progress of sculpture was in the main caused by that striving after a more and more complete representation of nature which I believe to underlie the whole history of art. It would soon be found that the best material for rendering form was clay—indeed, nothing better has ever been discovered to the present day. Although very fragile when unbaked, yet in the form of terra-cotta it is of great durability; so when civilisation had advanced as far as the making of pottery there was a capital material ready to the hand of the artist. Strangely enough we find scarcely any traces of art in the remains of the new stone age, although amongst other signs of a greatly advanced civilisation there are abundant fragments of pottery. There seems, however, to have been a great gap between the two ages, and neolithic man can in no way be regarded as the descendant of palæolithic man. On the contrary, he apparently belonged to a quite different race, which had developed the useful arts whilst neglecting the fine arts.

What became of the earlier race is unknown. They may have gradually become extinct, or have migrated to other regions. It is not likely, however, that two such important discoveries as drawing and sculpture can have completely died out, and had to be reinvented. One may rather look forward to the progress of antiquarian research revealing some day a connected series of links between the cave fragments of Perigord and the sculptures and paintings of Greece and Italy.

In the meantime we must rely upon conjecture as

to the line taken by the progress of sculpture. Probably, when a sufficiently artistic race had arrived at the invention of pottery, one of the first uses to which they would put their new material would be the making of little terra-cotta statuettes, which would be undoubtedly coloured as soon as the first vegetable and earthy dyes had been discovered. They would then perhaps be not very unlike the charming Greek terra-cotta figures in the British Museum. As the arts advanced, all sorts of materials would be pressed into the service of sculpture, the earliest being probably wood. Marble or stone statues would require a great perfection of cutting tools, whilst bronze casting is only possible in an advanced state of society. We have said that sculpture was coloured as soon as the discovery of dyes made it possible. This was not merely the barbarous taste of the rudest ages, but extended to the time at which the art had reached its highest development. There seems to be little doubt that such a thing as a white marble statue was unknown to the ancient Greeks. How far these statues were coloured is of course uncertain; but traces of colour have been found everywhere. How little taste the Greeks had for the cold severity which we are wont to associate with statuary can be judged from their great partiality for colossal figures in ivory and gold. The gold was used for the hair and draperies, the ivory giving to the flesh a colour and texture that resembled nature. It is a difficult question how far the moderns are justified in their entire abandonment of colour; but it is certain that anything like a true realistic colouring in statuary is an impossibility. No painting or tinting can ever make clay, plaster, or marble resemble flesh;

a nearer approach can be made in a material like wax, but even in this the imitation must always be imperfect on account of the difference of texture in the two substances. For instance, the human skin is covered in most places by very minute hairs, which without being seen individually give a softness to the outline which is wholly wanting in a wax model. This softness, and the other minutiæ which go to make up texture, can be almost perfectly rendered in painting on the flat, and no painting is like nature which entirely neglects them. But it is impossible to render them in painting on statuary. I think that these considerations quite justify the modern practice of entirely abandoning colour in sculpture. The true mission of sculpture is to teach the dignity and beauty of the human form—that is to say, it concentrates its energies on a small but most important part of the domain of art, whereas painting extends over the whole of it. The rendering of form is as much a part of painting as it is of sculpture; but the painter has so much else to consider that he is apt to neglect this most important branch of his subject. Fortunately he has always the sculptor by his side to bring him back to a higher standard of form.

The chief object of sculpture has ever been and always should be the representation of the human form in its most perfect development. It is a highly specialised form of art, and as such is capable of a perfection which is probably unattainable in painting.

PAINTING.

Painting in our modern sense is a very late development of art. Unlike sculpture it is dependent for its very existence on materials which presuppose a high degree of civilisation. It is the outcome of that continual striving after a closer and closer imitation of nature which we have noted as the great principle of art. The more nearly were natural objects imitated, the finer was the decoration, the more was the sense of beauty satisfied.

The first great step was no doubt the use of colours, the second that of shading. The first was obvious, and was probably adopted as soon as the discovery of coloured earth or vegetable dyes made it possible. The second must have been a comparatively late development.

The first attempt to give modelling in addition to outline, took, no doubt, the form of bas-relief. That the effect of solidity could be given not only by rounding the edges of an incised drawing, but also by the quite different method of darkening them by pigments, must have been a very startling discovery, and was very likely the result of accident.

But this step once gained there was nothing to stop the progress of painting. A flat surface could be made to look like a solid body. That was the great discovery, the rest was a process of gradual development: the improvement of materials going hand in hand with increased skill in using them.

With the one exception of occasional want of

permanence our materials now leave little to be desired. If the power of imitation fails us the fault lies with the workman and not with his tools.

There is possible at this present time an art of painting in which nature shall be reflected as in a mirror, wherein those who cannot see nature for themselves shall be taught to see and love her through the eyes of others.

It is sometimes objected that the mere imitation of nature is a base and degraded aim—that art should soar high above all vulgar realism—that what is valueable in a picture is the insight into the mind of the artist, and so on, and so on.

Now be it observed that I have said nothing of the imitation of nature being the sole or even the highest aim of art; but it is one aim, and that a most important and legitimate one; indeed, it is so important that the highest art is impossible without it. I have reserved for a later page a discussion of imaginative art; but it is clear on the smallest reflection that the painter of the most ideal subjects must know how to draw and colour, which is but a short expression for being able to represent the forms and hues of nature; and the better he draws and colours the more will he be able to impress his thoughts on others. It is also obvious that it is impossible to acquire the power of imitation without constant practice, so that realism at the worst is an indispensable step towards the highest forms of painting. But it is much more than this with the vast majority of artists, it is not a step towards something higher, but the goal itself to which their efforts should tend.

True imagination is a very rare quality, and the

men who are capable of teaching or inspiring their fellow men must always be few in number. For most artists to aspire to be teachers is to mistake their own powers, but all who have the artistic sense can, by their reproductions of nature, aid their fellows to see as truly and to admire as deeply as they themselves have done. As poets and teachers they are but pretentious failures, as observers and recorders they can do work as useful in its way as that of the few who tread the loftier path.

These truisms are so obvious that I should be ashamed to write them were it not for the discouragement that is continually shown to those earnest students who think that nature is more beautiful and more worthy to be recorded than their own imaginings.

So far I have endeavoured to give some slight idea of what is practically a new subject of research. The origin of the art of design has only just begun to be investigated in a scientific spirit, and consequently there is very little that is known about it with any degree of certainty. But the subject must be so full of interest to all who are engaged either in the practice or in the study of art, that I think no apology is needed for having ventured on this very debatable ground. It is true that I can give no certain information, but I can at least show on what lines the inquiry is proceeding, and if the conclusions I put forward are mere guesses it must be remembered that guesses or hypotheses, made with a view to subsequent verification, are a necessary part of scientific progress.

The remainder of this little work rests on much surer ground. There are still some very doubtful points connected with the theory of colour; but for

the most part I have merely endeavoured to put as clearly as possible results that have been repeatedly verified, and which form part of the great body of recognised scientific truth.

I have confined myself to the subject of painting as the technical part of sculpture is comparatively simple. The sculptor must know the human form to perfection, and must be richly endowed with that sense of beauty of form and harmony of line which cannot be taught, and for which no formulas can be given. Let him learn anatomy for the better understanding of the living models from which he practises, and let him develop his taste by constant study of the masterpieces of classical sculpture. Such is the chief training necessary for the sculptor.

For the painter it is very different, the pitfalls that beset him are numerous as the domain of his art is wide. His range is the whole visible universe, but the power of depicting it is not lightly nor ignorantly gained.

I shall now endeavour to give the outlines of such knowledge as may be useful to the student; of course no amount of knowledge can enable him to dispense with unceasing practice; but there is all the difference in the world between unintelligent practice, and practice that is directed by an insight into the difficulties that have to be overcome.

THE PRACTICE OF PAINTING.

The student of the art of painting generally suffers from the want of any definite principles to guide his studies. The variety of methods appears to be endless, and is only matched by the infinitude of theories to which they have given rise. And yet it is not at all impossible to reduce this chaos to some little order. First of all, the aim of the student is, or should be, very simple. He must learn to imitate nature. Whatever his natural bent may be, he must acquire this power of strict imitation, either as an end in itself, or as a means to the full expression of his genius.

This power of imitation is of very slow and difficult growth, and like most arts is best acquired somewhat methodically.

The art of putting dabs of paint on to a canvas so that it shall eventually present the same appearance to the eye as the object represented, involves a great many complex considerations. The painted object must appear to have the same outline (more correctly to lie within the same boundary) as the real one; it must have the same apparent lights and shadows. The colour must be the same, and this not only in its general aspect but in its minute peculiarities, *i.e.* if the real colour is visibly broken up into little patches, so must be the painted colour. The surface, too, must appear as rough or as smooth in the painting as it does in the object represented.

Now these various resemblances can be taken

separately so as to simplify the task of the student. The simplest, and perhaps the most important, is the resemblance of outlines or boundaries.

BOUNDARIES.

It is often said that there are no outlines in nature —figures are not surrounded by a line, therefore outline drawing must be entirely false. As beginners are frequently troubled by imaginary difficulties of this kind, it may be as well to examine this question carefully.

It is true that there are no outlines, but everything has a boundary—and these boundaries have a definite shape. Every object in nature divides space into two parts, the space where it is, and the space where it is not; between these two portions of space, there is a boundary which is not space itself, for it takes up no room, but it has form for all that.

Take any object, say a piece of wood; the surface of the wood is the boundary that divides it from the air around it, but this surface is not a thin film of the wood itself, for it has no thickness, it is where the wood ends and the air begins—it is also the surface of the air where it joins the wood, but it is not air for all that. It is the boundary between the two—just that and nothing else. In the same way that a solid body is bounded by a surface so a surface is bounded by a line. Take a sheet of white paper and colour part of it black. Now the sheet is not a surface for it has thickness, but where the sheet joins the air above it

there is a surface which is either the upper surface of the sheet or the under surface of the air, whichever way you choose to look at it. Where the black part of the paper ends and the white begins, there is a line which is the common boundary of both of them. This line is neither black nor white, and it has no breadth for the two parts of the surface are in contact, but it has a form for all that. It is, in fact, the line, as Euclid defines it, having length but no breadth.

Now all things, even solid objects, appear to the eye as surfaces; we **see** that they have length and breadth, we only **infer** that they have thickness. It is this that enables a painting on a flat surface to so completely resemble a solid object, that it can actually deceive the eye. Therefore the boundaries of all objects appear to the eye as the boundaries of surfaces and can be properly represented by lines. But these lines must be Euclidean lines, that is, they must have no breadth. But then, how are we to see them? Very easily, by making them the boundaries of surfaces of different colours. If we make a black mark on a piece of white paper, the outside of this black mark, where it joins the white, will be a true mathematical line, and can have the precise apparent form of any boundary in nature. So that we need not trouble ourselves how thick our black trace is, we must make the outside of it have the same form that the outside of the object seems to have to the eye, and we shall have a proper representation of the shape of that object. It is not necessary, however, that we should take the outside of our mark, the inside would do just as well; all we want is the dividing line between the black and the white, and in practice we generally

make our outline so narrow that it does not much matter whether we take the inner or the outer edge of it as representing the boundary of the object. But it must be recollected that a thick outline will represent the most delicate form if only we know which edge of it is meant as the boundary.

As a rule the outer edge is meant, but this is not invariable. In some drawings of the old masters one can see a thick black outline to the light side of a face, which outline is meant for part of the dark background round the head; in this case it is the inner edge that must be taken.

All these elaborate refinements about boundaries may seem very trifling and unnecessary, but it is by such elementary considerations as these that the science of geometry has been placed on a sure foundation. Indeed, a great deal of the modern progress of the science has been made by attentive study of these apparently trivial matters, so no art student need be ashamed to devote a little time to the principles which underlie outline drawing.

OUTLINE DRAWING.

When the boundaries of an object are represented apart from its other qualities, the process is called outline drawing. It is a general, and a very sensible practice that the student should begin with this before attempting the further difficulty of light and shade. It is customary to divide this into two steps, the first being drawing from the flat, *i.e.* copying another

drawing, and the student is generally kept at this for some time before he is allowed to draw from solid objects. There is some justification for this, as the mind has a great difficulty in separating the one aspect of an object before it from all the other aspects in which it has ever seen it, for the idea of the object, being a kind of compound of all these aspects, is apt to influence the actual image. I shall return to this point when I treat of perspective; for the present it is enough to say that it is one of the great difficulties in the way of good drawing, a difficulty that it is so important to conquer that the student had best be placed face to face with it as soon as possible without wasting too much time in the far less important operation of drawing from the flat.

Of what sort of objects is it best to make outlines? Of simple ones at first. Anything will do; a book, a candlestick, a chair, anything; as long as it is drawn as accurately as if it was the most precious thing upon the earth. Then the student can be promoted to draw from casts from the antique, which will educate his sense of beauty besides training his eye. Drawing from the living model had best be reserved for a later stage, as it is quite hard enough to represent a motionless object without being troubled with the slight changes of position which no living model can help making.

LIGHT AND SHADE.

Shading is the next difficulty for the student to wrestle with. It presupposes a power of outline drawing, as the reproduction of the true form of the lights and shades is one of the factors that make up correct modelling. The other is the relative intensity of the lights and shades, the amount of light the eye receives from any object being quite separable from the form and colour of it. The absolute degree of light can seldom be imitated in a drawing, but this is of little consequence as the eye is chiefly conscious of relative intensities, and these can be very perfectly rendered. For instance, let the light side of an object send to the eye twice as much light as the shadowed side. This proportion will remain almost unaffected by considerable variations in the whole illumination; the light could be increased or diminished ten or twenty-fold, but still the light side of the object would be twice as bright as the dark side, and the object will look much the same to the eye. If the drawing has the light and shade in the same proportion, the eye will accept it as a true representation, no matter what illumination it receives.

TEXTURE.

As it is hardly possible to study light and shade properly without considering the further difficulty of texture, it may be as well to turn the student's attention to this, after he has made a few studies in black chalk, or charcoal. Complete rendering of texture is only possible with the aid of colour, but a great deal can be done with an imperfect material like black chalk. We will suppose the student has been working from a plaster cast, which is on the whole the best thing from which to study light and shade and outline. Let it be a cast taken from a real hand. In what way should a drawing of this cast differ from a drawing of the hand itself?

The form of the two objects is the same, the light and shade can be made the same, and yet they are not quite alike. In what does the difference chiefly consist, and how can it be rendered in a drawing? Of course the colour is different, but that we will disregard; but there are other differences, and of these the drawing can take account. The edge of the cast is quite smooth everywhere, consequently the drawing should have a perfectly definite boundary. There should be no blurring or indecision anywhere.

Now look at the hand. In places it is covered with minute hairs, in other places it is quite smooth. At the distance at which the hand is generally seen the hairs cannot be separately distinguished, but they have their effect in slightly blurring the outline. Where these hairs are absent the outline is quite definite, like that of the cast. This is the chief

difference to the eye, and insignificant as it sounds, it is nevertheless of vital importance to the figure-painter, as no accuracy of outline, modelling, or colouring, will make his painting look like flesh if he neglects it. There are other minor differences which should be observed between the hand and the cast. In certain lights the edge of the hand is slightly transparent. This also gives a softness to the outline which can never occur in the cast. Again, the surface of the nails is so much smoother than the rest that it can reflect a definite sharp light from a window or any other source of illumination. This also is absent in the cast. Indeed, speaking generally, there is much more variety of roughness and smoothness in the hand. There are also variations of local colour in the hand which modify the general light and shade. From these again the cast is free.

It will perhaps be objected to all this, that such a close imitation is not only not desirable, but is not even possible. As for its not being desirable, I can only repeat that the **power** of close imitation of nature can only be of advantage to the painter. He need not exercise it, but if he prefers to clothe his imagination in conventional or abstract forms, let him at least do so of free choice, and not from the incapacity of doing anything else. As to the possibility, there is no greater difficulty in making a blurred outline than in making a sharp one. It merely requires close observation to see when one or the other should be used, and all the other minutiæ are very simple matters, which the hand can execute with ease, as soon as the eye has been taught to perceive them.

I have said nothing so far with regard to the method employed in shading, for, indeed, I do not think it much matters what method is used. If the student's object is to practise shading merely as a stepping-stone to painting, then I think the use of the stump is to be recommended. In the first place it is more speedy than working with the point; in the second place the effect produced is more like that of painting. If, however, the student wishes to work at drawing for its own sake, there is undoubtedly more beauty and expression to be gained by using the point. As to whether chalk, or lead, or silver shall be used, whether the lines shall be curved or straight, simple or cross-hatched, that each draughtsman must decide for himself according to the effect he wishes to produce. Beautiful work has been done in all these ways, as any one can see by studying the drawings of the Old Masters. These drawings are fortunately within every one's reach, as they have been very extensively and very perfectly reproduced by photography. The study of them is valuable for many reasons, not the least important of which is that it is fatal to the notion that there is any one exclusive method of draughtsmanship.

When the difficulties of texture have been to some extent overcome, it is time to draw the student's attention to certain aids to drawing, which, indeed, can never enable him to dispense with the closest observation of nature, but which, in certain special cases, can direct and supplement this observation.

By common consent the human form is the ultimate test of good drawing. A man who can draw that well can draw anything. Now the human form, although

in its general aspects it is so well known that any gross deviation from nature in a representation of it is immediately detected by the eye, is one of the most changeful of natural objects. It is made up of a vast number of parts capable of separate movement, the whole concealed by an outer covering which prevents the internal mechanism from being too closely seen.

ANATOMY.

By the science of anatomy, which strips off this outer covering, and makes us familiar with the internal mechanism, we can obtain a clue to this bewildering labyrinth of ever-changing form. We must not, however, exaggerate the importance of anatomy to art; it can only serve as a slight aid to the direct observation of nature, never as a substitute for it.

It is certain that the Greeks of the best period of art, knew next to nothing of anatomy, but their knowledge of the human figure has never been equalled. Moreover, there is a positive danger to the artist in anatomical as in all other science. It creates a tendency to put down what he knows to be there, whether he sees it or not—a tendency fatal to all good drawing.

But to the student who is on his guard against this danger, there is certainly much profit to be derived from anatomical study, for it enables him to supplement the deficiencies of his models, and above all to express movement and action, for

which no study from models can give more than suggestions.

It must be remembered that the kind of anatomical knowledge that is of use to artists is widely different from that required by physicians or physiologists. The artist is only concerned with the superficial aspects of things. No organ that does not affect the appearance of the surface of the body need enter into his consideration. As artist he has nothing to do with the brain, or the nerves, or the viscera, no matter how important they are to him as a man. The skeleton on the other hand is of the greatest importance to him, as it constitutes the framework which supports all the other tissues. The study of the bones is the more useful in that they form the most constant elements of the body. Their form remains unaltered during the most violent movements, and their relative positions are only changeable within certain well-defined limits. Next in order of constancy come the cartilages, tendons, and ligaments, which unlike the bones are flexible, but like them are incapable of extension. The muscles show a further power of movement, they are not only flexible but they are also elastic. When stimulated by a nerve they grow shorter and thicker. It is this property of muscles that enables all the movements of the body to be performed. Roughly stated, whenever the body moves it is because some muscle or muscles have become shorter, and thereby pulled some portions of the skeleton nearer together. All the obvious movements of the body, or of its parts, are produced in this way. From this it will be understood how very important for the proper

representation of movement is the study of the muscles, how they are attached to the bones, and how these latter are made to move by their contraction.

There is nothing else in anatomy that is of much importance to the artist. The superficial blood-vessels are sometimes visible, but they vary so much in different individuals that they must be drawn from direct observation unaided by science.

PERSPECTIVE.

There is another aid to drawing which is perhaps more important than anatomy. Perspective is essentially the science of representing the form and dimensions of things as they really look, quite apart from any consideration of what they really are, as determined by touch or by measurement, or any other means. The aspect of things is continually changing —in order to remember them at all we must have a conception of them under one definite aspect—an aspect which is often determined by quite other considerations than those of sight. This conception is apt to become mixed up in our minds with the appearance that an object presents on any given occasion.

For instance, the actual appearance of the top of a square table may be that of an irregular rhomboid whose angles and size vary with every movement of the spectator. Our conception of it is that of a square, although perhaps we have never seen it under

this aspect. So strongly does this conception influence our minds that even a trained artist finds considerable difficulty in drawing the top of a table flat enough, unless he is aided by perspective.

The same principle may be observed in the natural tendency of any untrained person to draw the two wheels of a cart the same size, although one may be a great deal nearer to the spectator than the other and will consequently look much larger. The two wheels are known to be the same size by measurement, they are therefore supposed to be the same in

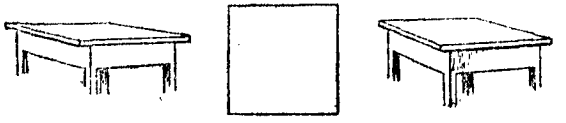

FIG. 8.—Actual appearance. Conception. Tendency of the draughtsman.

appearance, the testimony of the eye being falsified by the conception formed by the mind. A great part of the use of perspective is to correct such erroneous judgments.

The theoretical part of perspective is very simple. In its most general form it can be comprised in one rule:—An object occupies a smaller area of the field of vision in proportion as it is further off, or, more precisely, the apparent diameter diminishes in the direct ratio of its distance, *e.g.* a book a yard off looks twice the height and twice the breadth (that is, four times the size altogether) of another book of the same dimensions seen at a distance of two yards. If any

one doubts this the experiment is easily made. Take two books as nearly as possible of the same size and carefully stand them on a table, one at a yard from the edge, the other at two yards, in the same line. Then place the eye at the edge of the table and manœuvre so that the further book projects slightly to one side of the other; the further book will be found to come just half way up the other. It is nearly, if not quite, as easy to prove by experiment that the rule holds as well for the breadth as for the height, but people who have been convinced of the one are not likely to be sceptical of the other.

Our rule, it will be observed, is delightfully simple, but it is unfortunately ill-adapted to practical application.

For this we must look at the matter from another point of view. Our perception of objects depends entirely on the power they have of transmitting light to us. I shall say something of what is known of the nature of light further on, for the present it is sufficient to say that light only travels in straight lines, and that it is this property of light that gives rise to the law we have just stated. If we could make straight lines pass through our drawing paper from an object to our eye, the points where these lines passed through the paper would accurately represent the points on the real object from which these lines proceeded, and by joining these points on the paper we should have a perspective drawing of the object. A model can be constructed with strings which will give a good idea of the essence of perspective, but unfortunately this is a method that is of no use in practice.

Is there no means of getting these straight lines

except by strings? Certainly there is, we can use the rays of light themselves. If we fix a pane of glass in an upright position in front of some object, say a chair, and then fixing the eye at some convenient distance from the glass draw upon it the apparent form of the chair, we shall have a perspective drawing which has been determined for us by the rays of light that have passed through the glass from the chair to our eye. This is the simplest of all the perspective methods, and can be used practically in the case of any actual object, the drawing being afterwards transferred from the glass to the paper or canvas.

It is worth the student's while to practise this before proceeding further. The only precaution to be observed is to fix a piece of paper with a small hole in it at the distance in front of the glass from which it is intended that the drawing should be looked at, and to place the eye at this hole in order to avoid any danger of the eye changing its position. The glass can be drawn upon with a brush and Indian ink, the drawing can afterwards be transferred by means of tracing paper. By practising in this way the student will become impressed with the reality of perspective, and not regard it as a specious means of deceiving the eye. It should be clearly understood that all received methods of perspective are merely more or less elaborate ways of performing on paper, by means of rules and measurements, this very operation that the rays of light do for us on the transparent surface of the glass.

COLOUR.

When the student has acquired a good working knowledge of anatomy and perspective, he should turn his attention to a greater difficulty than any he has yet encountered, namely, colour. Before giving any practical instructions, I shall endeavour to give some slight idea of the modern theory of colour.

It is now well established that the physical cause of the sensations of light and colour is to be sought in the undulations (or more correctly periodic disturbances) of a particular form of matter called the æther.

All material objects are supposed to be built up of minute particles called atoms, somewhat in the same way that a house is made of bricks, only these bricks are not quite close to one another but have spaces in between. These spaces are filled up by a much finer kind of matter which is perhaps made up of much smaller atoms than any which compose material bodies; or perhaps it is not made of separate particles at all, but is structureless, like, for instance, what water seems to be, although it is really nothing of the kind. This medium, the æther, which prevades all space and extends certainly as far as the furthest visible star, and how much further we know not, has the property of transmitting certain kinds of vibrati. These vibrations are propagated in straight lines and are transverse to the line of propagation, that is they swing backwards and forwards accross the track on which they are travelling. The rate of propagation is the same for all vibrations, but the length of the

wave (that is the distance between two vibrations) varies. It is always very small, but small as it is, it can be accurately measured. When waves of a certain length strike the eye they produce the sensation of light; when these same waves or other longer ones strike the skin, they produce the sensation of heat. There are shorter waves which have no apparent effect on the body but which can impress an image on photographic plates or make other chemical changes.

The waves of medium length, those that cause the sensation of light, are the ones with which we are here concerned. I have mentioned that these waves travel in straight lines. They invariably have their origin in some self-luminous body—that is a body of which the atoms are vibrating very rapidly, and they are reflected from any object that they strike upon; from objects with a smooth surface they are reflected in definite directions, so that the angle of reflection is equal to the angle of incidence; but from most objects they are dispersed in all directions. There are some objects called transparent that these waves pass through with hardly any hindrance, other objects which are called opaque stop them and send some of them back again, and turn others into longer vibrations which are no longer sensible to us as light but only as heat.

In passing through transparent bodies the waves are liable to deflection, that is, to being turned out of their course. This deflection arises when the wave strikes obliquely on a substance of different density from the one it has been travelling in. This property is made use of in the construction of lenses. A lens

with which we are all familiar is the bi-convex lens, the lens of which old people's spectacles are made. Its action is as follows (see diagram, Fig. 9):—

All the rays of light that fall on the lens from a point without it are bent towards one another, first in passing from the air into the glass, again in passing out from the glass into the air, so that (unless the point is very close to the lens) they recombine into a point on the other side of the lens. Let *A* be the point in space and *O* the lens, then all rays from *A* that strike on *O* will reunite at *a*. Similarly all rays from *B* will reunite at *b*, and rays proceeding from

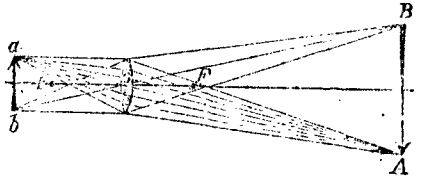

FIG. 9.

any point along the line *A B* will reunite in some equivalent point along the line *a b*, so that if a piece of paper or any other suitable screen be placed at *b a* an inverted image of *A B* will be formed on it.

This, indeed, is what happens in the ordinary photographic camera. A lens throws an inverted image of the scene outside on a glass plate that has been rendered sensitive to light.

The human eye (Fig. 10) is of very similar construction to a photographic camera. It has an optical arrangement which throws an inverted image of any object outside on to the retina, a network of minute nerve fibres

joined to a peculiar apparatus called the rods and cones, the whole forming a surface very easily affected by light. This optical apparatus is essentially composed of the cornea, the aqueous humour, the crystalline lens, and the vitreous humour. The cornea is a transparent sheet of fibrous tissue, which, together with the aqueous humour behind it, exercises a strong

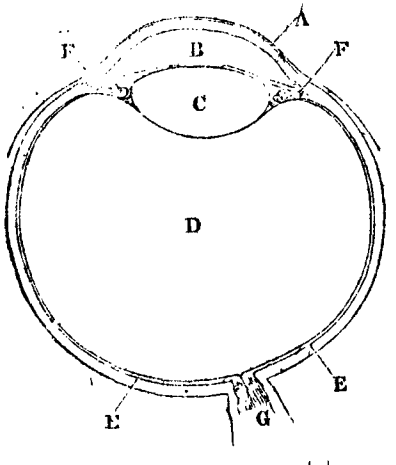

FIG. 10.—The human eye. A, cornea; B, aqueous humour; C, crystalline lens; D, vitreous humour; E, retina; F, ciliary muscle; G, optic nerve.

convergent effect upon any rays that pass through it. In fact, as the cornea is convex, and both it and the humour behind it are much denser than the air, the two combined act like a single convex lens. Behind these again is the crystalline lens, which being much denser than either the aqueous humour in front of it,

or the vitreous humour behind it, is enabled by its double convex shape to materially assist the convergence of the rays. This crystalline lens has another most important function—that of bringing objects at different distances to a proper focus on the retina.

It will be observed from studying the diagram that the distance behind the lens at which the rays of light from a point in front of it are reunited depends on the distance of the said point, so that objects at different distances cannot all impress a distinct image on the same surface. This is practically shown in focusing for photography, where the lens has to be shifted backwards and forwards in accordance with the position of the principal object to be represented. In the eye this focusing or adjustment is obtained in a different way. The crystalline lens is kept in a state of tension by a circular ligament; this tension can be relaxed by the action of the ciliary muscle, the effect of which relaxation is that the lens becomes more convex—becoming flatter again when the action of the muscle is withdrawn. In this way a healthy eye can almost instantaneously bring objects at any distance (except those quite close to the eye), to a sharp focus on the retina.

We will now consider what goes on at the retina itself. It is a membranous expansion of the optic nerve, and forms the innermost coat of the eye. It is provided with minute structures, called the rods and cones, with each of which a nerve fibre is connected. These rods and cones are the only elements in the apparatus of sight which respond to the stimulus of light; the nerve fibres merely transmit

this stimulus to the brain, as they would any other that was communicated to them.

The waves of light proceeding in straight lines from every point of the object looked at, are deflected in their passage through the cornea and the crystalline lens, and brought to corresponding points on the sensitive layer. The rods and cones are set trembling, each in proportion to the light received, and by their vibration they excite the corresponding nerve fibres, which in their turn transmit the motion to the particular portion of the brain in which the sensation of sight is located. This sensation of sight can be excited by other means than light; pressure on the eyeball, an electric shock, congested blood vessels, anything that disturbs the optic nerve will give rise to the specific sensation of sight and to nothing else. All these varied disturbances are referred by the brain to the source that most often gives rise to such disturbances, *i.e.* light—a consideration which will explain the frequency of optical delusions.

All sight is in fact an act of judgment. The brain receives messages from each retinal element, and from these messages it constructs a mental picture of the actual scene much in the same way that a general, whilst a battle is going on, receives messages from all sides, and from these messages forms his idea of what is happening on the field of action. So far does the analogy hold, that the mind supplies from its own knowledge a great part of the mental picture, the actual messages from the retina being quite insufficient to give a complete perception of the scene without.

This is a very rough sketch of the nature of seeing in general. There remains a special point to be

considered, which is of the highest importance to the artist. We are affected not only by the strength and direction of the waves of light, but also by their quality. Waves of different length give different sensations of colour. I have already explained that by the length of a wave is meant the distance between two waves. The longest visible waves give rise to the sensation of red, the shortest to that of violet. Between these extremes there is an unbroken series of waves of intermediate lengths, which correspond to the series of colours seen in a rainbow, red, orange, yellow, green, blue, and violet. Other colours are produced by a mixture of waves of different lengths. A mixture in certain proportions of waves of all lengths gives the sensation of white. The variety of tints that can be produced by mixtures of different wave-lengths is of course incalculable, but these tints can nevertheless be reduced to a certain order. It is found by experiment that there are some tints that can be produced by the mixture of others, whereas others cannot be so produced. These latter are called primary colours, and are capable of generating all the others. Of these primary colours there are only three. A good deal of confusion has been brought into this question by considering the mixture of pigments as the same thing as the mixture of colours, to which it only corresponds very imperfectly. From experiments with pigments, it was supposed that the three primary colours were red, yellow, and blue, but the effect of adding one pigment to another is to subtract from the light that the first one gives out, whereas what is wanted is to add coloured light of one kind to coloured light of another kind. This is

the true mixture of colours. There are various ways of doing this, perhaps the simplest is by what is called Dove's experiment (Fig. 11).

In the diagram, *c* is a little plate of glass, *a* and *b* are two objects, say wafers, of different colours. One is seen by the eye through the glass, the other is seen reflected from the surface by the glass; with a little adjustment the two images can be made to coincide, and the result is a true mixture of the colours of both. The difference between the mixture of pigments and the mixture of colours comes out strongest in the case of

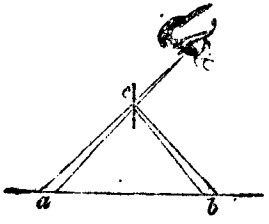

FIG. 11.

yellow and blue. Every one knows that yellow and blue paint together make green, but if the mixture is made by means of yellow and blue wafers in the manner shown above, the result is not green but white. From experiments performed in this way, and in other similar ways, the three primary colours have been found to be red, green, and violet. By a mixture of light of these three colours all the other tints can be produced.

The question here arises, What is there in the constitution of light that corresponds to these primary colours? The answer is: Nothing. There are not

three different kinds of waves, but an unbroken series of waves gradually diminishing in length, from the longest visible to the shortest visible, with no special differences corresponding to these primary colours. The waves that are seen by us as a distinctly secondary colour, like orange, only differ in degree from the waves that cause the primary sensation, red. But neither is there any difference in kind between the waves that produce the sensation of heat, and those that produce the totally different sensation of light. The cause of these differences must be sought for, not in the rays of light themselves, but in the being that perceives them.

Early in this century a very simple explanation of the problem was discovered by an Englishman, Thomas Young, but was rejected at the time and fell into oblivion, until the greatest living authority on these questions, Helmholtz, revived it in his great work on physiological optics, since which time it has been generally received by scientific men, and although it has not yet reached the stage of absolute demonstration, can be considered as well established in all essential points. The theory is this :—

"It is supposed that there are three different kinds of nerve elements in the retina, which give rise to the three different sensations of red, green, and violet. The nerve elements which cause the sensation of red are affected by the longer waves, and are almost insensitive to the others. While in like manner the waves of medium length affect the nerves which cause the sensation of green, and the shorter ones affect those that cause the sensation of violet. Intermediate wave lengths affect simultaneously two

sets of nerves, thus giving rise to secondary colours, while a mixture of different waves can affect them all three, and thus give rise to further compounds. When all three sets of nerves are equally affected the sensation of white is produced.

This is, very roughly, the theory that has been found capable of solving some of the very hardest problems of colour, and which has been confirmed by a great mass of experiments, which I have no space to mention here. I will give one instance of a very puzzling problem which has been satisfactorily explained by this theory, viz the phenomenon of colour blindness.

It is well known that there are some people who seem to be unable to distinguish colours which appear quite different to the world at large, for instance, such people will often confuse red with grey or green. But these said people can distinguish all the different shades of yellow with the greatest nicety, and never make any mistake between yellow and blue. This is the usual form of colour blindness; where the defect is very pronounced no red is perceived at all, though the perception of all colours into which red does not enter can be fully as acute as that of ordinary persons. Now it is only necessary to suppose that the nerve elements which are excited by the longest visible rays are absent or paralysed, and all these phenomena are explained. There are other less usual forms of colour blindness which seem to depend on the absence of one of the other sets of nerves. Armed with this theory we will now consider the question arising out of the mixtures of colours and pigments.

The sensation of white can be produced by the most different mixtures of coloured lights—by scarlet and bluish-green, by greenish-yellow and violet, by yellow and ultramarine, by red, green and violet, or finally by a mixture of all the colours of the rainbow. All these mixtures produce precisely the same impression on the eye, but in no other respect are they alike. For instance, a surface lighted up by scarlet and bluish-green light will come out black in a photograph, whereas another lighted up by greenish-yellow and ultramarine will come out very light. To the eye they would both look equally white. In fact there is no resemblance between the physical properties of these various mixtures of light. They agree in producing the sensation of white, but in nothing else. According to Young's theory the explanation of the puzzle is a very simple one. These various mixtures are alike in this—that they all excite all three of the nerve elements. For instance, in the first mixture the scarlet excites the red-seeing nerves, whilst the blue-green light excites the other two sets. In the second mixture the greenish-yellow excites the red and green-seeing nerves, whilst, of course, the violet light excites the violet-seeing ones. And so on throughout the series.

It may startle those who are only accustomed to the mixture of pigments to hear that blue and yellow light do not produce green but white. That this is so can be readily proved by the experiment mentioned above. But why do blue and yellow paint produce green? It is a question, as we have mentioned before, of the subtraction of colours, not of their addition. The blue paint absorbs most of the red,

orange and yellow waves, reflecting back to the eye the green, blue and violet, the result of which is a general impression of blue. Now take a yellow paint which absorbs the blue and violet, reflecting back the red, yellow and green. A mixture of these two will absorb, more or less, every colour except green, which will be, therefore, the dominant tint of the mixture.

The question of the mixture of pigments is very much complicated by the fact that none of the pigments in use represent any pure colour. When examined by the spectroscope they are found to reflect light of many different colours, their whole effect being the average of these different hues. Indeed, the eye is quite incapable of distinguishing a pure colour of which the light is all of the same wave-length—such as any of the colours of the rainbow—from a highly compound colour of about the same average wave length. Indeed, according to the Young-Helmholtz theory, an eye in its natural condition never sees a pure colour. For each set of nerve elements is not only excited by its own appropriate colour, but also receives some slight stimulation from the other colours. The purest spectral red, for instance, not only excites the red nerve fibres, but has also some power of exciting the other two sets of nerves, so that we never have a sensation of red without its being somewhat mixed with sensations of green and violet. There is, however, a means of seeing red without this admixture of other colours. The nerves of the retina are very easily tired; when tired they lose their sensitiveness to light. Now it is possible, by wearing spectacles of a strong greenish-

blue colour, to prevent any of the red rays from reaching the eyes. After these spectacles have been worn for some time in a strong light, the green and violet nerve elements become very tired, and lose to a great extent their sensitiveness, whereas the red nerve elements have had a complete rest. If the spectacles be now taken off, and the eyes turned towards the red part of a spectrum, the red-seeing nerves will be in their highest condition of efficiency, whilst the other ones, being tired, will be quite unaffected by the red light. The result is a sensation of red, much more intense than any that can be seen in normal vision. In fact, under these conditions alone can the eye see pure red. The same thing is true with regard to the other colours, so that under ordinary circumstances we never see any pure colours at all.

It is by this susceptibility of the retina to fatigue that the very curious phenomena of the so-called "negative images" are to be explained. Look fixedly at a bright spot of red, then transfer the gaze to a sheet of white paper. There will appear a faint image of the spot; but instead of being red it will appear a sort of blue-green. In the same way a blue-green spot will produce a red image; a blue one will produce a yellow image, and vice versâ.

The image is always a different colour from the original, and indeed as different a colour as it can possibly be.

These experiments are the easier to make, as an enterprising firm of soap boilers have sown broadcast throughout the world advertisements in which the principle of negative images is made use of to call attention to their goods.

COMPLEMENTARY COLOURS.

I have said that the after image is of as different a colour as it can be from the object that calls it up. In other words, it is the *complementary* colour of the object. Complementary colours are those which mixed together in certain proportions produce a perfectly neutral tint. If sufficiently luminous they will produce white. I give a list of the principal ones, as they are of considerable importance in painting, giving as they do the strongest attainable contrasts of colour.

Red . . .	Blue-green.
Orange . . .	Greenish Blue.
Yellow . . .	Blue (Ultramarine).
Greenish Yellow .	Violet.
Green . . .	Purple.

These pairs of complementary colours are alike in this, that each member of the pair has the power of exciting those nerve elements that are left uninfluenced by the other member. So that, together, they excite equally all three elements.

The negative images are explained in this way: a portion of the red-seeing nerves in our first instance has been fatigued by the action of the rays coming from the red spot, so that this part of the retina has become more or less insensitive to red. The eye is now directed towards a sheet of white paper, *i.e.* a surface which reflects rays of all colours; in those parts of the retina which are in their normal state all the three nerve elements are equally excited, and the

result is the sensation of white; on the small spot, however, where the red nerves have been fatigued, they respond much less to the stimulus than do the green and violet ones. So that here a preponderating bluish-green sensation is produced. The other negative images can be explained in a similar way.

CONTRAST.

Fatigue of the retina will also account for most of the curious phenomena of contrast. It is well known that when two complementary colours are placed side by side they both gain in brilliancy. We will suppose these colours to be red and blue-green. The eye, as it is naturally used, wanders about incessantly from one to the other (to fix the eye on any one spot requires indeed a considerable effort). When looking at the blue-green, the red nerves are given a complete rest, so that when the red in its turn is looked at, it is perceived with increased intensity; then again, the green and violet nerves are rested, and are in a proper condition to be highly stimulated when the gaze is transferred to the blue-green. Similar results are obtained with any juxtaposition of colours; like colours have a deadening effect on one another, whereas unlike colours give a mutual increase of brilliancy in proportion to their unlikeness. Colours that are neither quite like nor quite unlike suffer also a change of hue. Although all these effects seem rather complicated they can be expressed by a very simple rule. *When two coloured surfaces are placed side by side each is changed, as though it had been mixed to some extent*

with the complementary colour of the other. For instance, put green and blue side by side; the green will look yellower, and the blue more purple than it did before. With red and blue, the red inclines towards orange and the blue towards green. The loss of brilliancy when like colours are placed together comes under the same rule, each is deadened by being mixed to a certain extent with a colour which resembles its own complementary; whereas the gain of brilliancy of complementary colours arises from their having some of their own colour added to them.

It must not, however, be supposed that the effect of contrast is entirely owing to fatigue of the retina.

There is a whole class of cases to which this explanation will not apply.

If a small piece of grey paper is placed on a sheet of green paper, the tint of the grey is hardly affected by the green unless the observer stares at it for a long time. But if a sheet of thin tissue paper be placed over both of them, the grey assumes at once a distinctly rosy hue, which in some cases seems almost stronger than the faint green around it. Now this is certainly not a case of fatigue, for the effect is produced much more strongly when the colour is weakened. It is no doubt an illusion of the judgment, but the questions connected with this illusion are too difficult to be entered upon here. It is the less necessary to dwell much on the contrast of feeble colours, as the effect produced is much the same in painting as it is in the objects painted. But the contrast caused by fatigue of the retina is entirely dependent on the brilliancy of the illumination, so that if the true colours of a strongly illuminated scene are represented in a

painting lit up by the dull light of an ordinary room, the contrast effects that come out so strongly in the real scene will be almost wanting in the painting, and will have to be suggested by a slight modification of the colour.

I have no space to deal any further with the modern theory of colour. I have endeavoured to give the merest outline of it, which those who like can fill up from Helmholtz's great work, the *Physiologische Optik*, or for those who are unacquainted with German, there is a recent volume of the International Scientific Series, *Rood's Modern Chromatics*, which treats very fully of the whole question. There is also a great deal to be found on the subject in Helmholtz's popular lectures, which have all been translated into English.

There are some people who affect a great horror at the idea of Science intruding upon the domain of Art. This feeling is, however, dying out now that science is becoming better understood. After all, science merely means knowledge. To say that one has a scientific acquaintance with a subject, means that one has an accurate knowledge of it—neither more nor less; and it is difficult to maintain at the present day, that a man who follows any pursuit is likely to do it the worse the more he knows about it. My earnest advice to all art students is not only to practise their art diligently, but also to seek to know as much about it as they can.

I will now return to the practice of art in its most difficult form; that of painting.

OIL PAINTING.

For the training of the student I strongly recommend the use of oil-colours in preference to water-colours. For this there are several reasons, the chief being that the former admit of much greater freedom of alteration than the latter; a most important point, for it is only by a process of continual correction that the learner can hope to advance. Again, the superior strength and brilliancy of oil pigments permit of a much closer imitation of nature than is possible with water-colours, to say nothing of the superior power of rendering texture which the former possess.

A great deal of unnecessary trouble may be avoided by a careful selection of such colours as are best adapted to render the innumerable tints of nature. My own palette is as follows, the colours being arranged in this order from right to left. I mention the order, as I have found it convenient in practice, and it is always as well to adopt a fixed position on the palette for each colour, so that the brush instinctively seeks it when it is wanted;—

Brown ochre.
Yellow ochre.
Naples yellow.
White.
Orange vermilion.
Light red.
Chinese vermilion.
Rose madder.

Burnt sienna.
Emerald oxide of chromium.
Cobalt.
Ivory black.
Vandyke brown.

I believe that these colours will be amply sufficient for all kinds of flesh painting, and they are, when good, quite permanent. There are some yellows and greens, especially such as occur in landscapes, which demand an additional pigment. The choice of this is one of some difficulty, having due regard to the question of permanency. Perhaps a very pale cadmium is the best. With this addition there are few hues in nature that cannot be matched with these colours, making allowance for an occasional loss of brilliancy, which is inevitable in rendering the strongest chromatic effects with mere pigments. I have the less hesitation in recommending this palette as I have adopted it from the one used by Mr. Alma Tadema. I have added Vandyke brown to the colours he uses, but this is the only difference that I have made.

The first thing to be done is to train the eye to accuracy in colour as it has been trained to accuracy in form. Unfortunately the first is much more difficult than the second. It is easy to find a teacher who can judge of accuracy in drawing; but to find one who can judge, with any nicety, of accuracy in colours is rare indeed. But in this, as in most other things, the greater part of the difficulty can be overcome by the pupil himself. Let him take some object, such as a plaster cast (an old one by preference, as this is sure to have acquired a considerable variety of tones which

are well adapted to try the skill of the beginner), and place it in a good light with a simple background behind it. Let him now place his canvas with the outline of the object carefully drawn upon it in a good side light where there is no shine upon its surface. Let him then mix a colour with his palette-knife to match any of the tints of the object; when he thinks he has something like the tint he should hold up his palette-knife in front of the object; if the loaded palette-knife can hardly be distinguished from the part of the object it is desired to match, then, and not till then, has the required tint been obtained. When obtained it should be transferred to its proper place on the canvas, and another part matched in the same way.

If one obvious precaution is observed, viz. that the palette-knife shall have much the same light upon it that the canvas has (a full light and no shine), the operation is a very simple one, only requiring a very moderately good eye and a great deal of patience; and by its means a picture can be produced, of any simple object, which will reproduce its tints with great accuracy. The great advantage of this method for beginners is that it trains the eye to accuracy quite independently of any correction from the teacher. I may mention that it was introduced into the Slade School by Mr. Poynter with excellent results.

When this has been practised sufficiently to give a high standard of accuracy, the student may try the method pursued by Mr. Millais. Place the canvas side by side with the object to be represented, only taking care to have it in a good light, and walk backwards and forwards between each touch, so that you are continually looking from a distance at the

picture and the object placed side by side. When your picture is finished there should be hardly any difference between it and the object. If there is much difference you can see what it is and correct it accordingly. This again is a method that renders the pupil to a great extent independent of any teacher. If he be honest with himself he can tell where the differences lie between his picture and the object represented, provided he can stand away from them and see them side by side. This gives such a direct means of comparison that none but a very dull eye can fail to detect a discrepancy, and if the student can only see his faults he can learn to correct them. The seeing correctly is the one important thing.

This method is not merely adapted to the student. For many kinds of painting it will be found permanently of use. For portraits especially, it is very valuable; indeed it can always be employed where there is a definite object side by side with which the canvas can be placed. I believe all Mr. Millais' figure pictures are painted in this way.

When the painting is less than life-size the canvas can be placed in advance of the object, so that the two look the same size from the distance at which the painter stations himself.

Should this method not be adopted it is, nevertheless, highly desirable to continually look at the picture one is painting from the distance at which it is meant to be seen when finished. No amount of calculation will enable a man who is looking at a picture three feet away to tell with any accuracy what it will look like at a distance of ten feet. The experiment must be continually tried during the progress of the

work. It is also highly advisable to have a looking-glass at hand. There are certain faults of distortion to which the eye readily accustoms itself. They can then no longer be detected by direct vision, but when inverted in the glass they strike the eye immediately. For instance, supposing a row of perpendicular palisades have been drawn by mistake leaning a little towards the right; the eye soon gets used to this, and accepts all lines in the picture leaning a little to the right as perpendicular. But when these said lines are seen in the looking-glass they lean to the left, so that their divergence from the perpendicular is at once detected, in fact it appears twice as much as it really is.

Having considered the most important point, namely, the means of training the eye, we now come to the question of manipulation. With regard to this it is impossible to say much that will be of help to the student. There are certain results that have to be arrived at, and how they are arrived at is a matter of the utmost indifference. It may perhaps be said that there is an easy way and a difficult way of arriving at good results, and the pupil should be taught the easy way;—I answer, certainly, if it is possible to do so—but, unfortunately, the easiest way of painting for one man is the most difficult for another, and the safest method of learning is for the student to be left free to choose the way that suits him best, helping himself every now and then by studying the various ways in which the great painters have overcome the technical difficulties of their art. The beginner will perhaps ask, is he to lay on his paint thickly or thinly? I can only reply, that some admirable painters have gained their

effects by painting thickly, others no less admirable by painting thinly. He may choose whichever method he finds most convenient; but he must make his picture look like nature somehow.

TURBID MEDIA.

There is one matter, however, connected with execution that demands a less summary treatment. One of the first things that will be remarked in oil-painting is the change of hue undergone by pigments in accordance with the manner in which they are placed on the canvas. For instance, rub a little ivory black thinly over a white canvas, it will appear a distinct brown; mix the same colour with white, it becomes a neutral grey; brush this grey thinly over a black ground, it will have a distinctly bluish tinge; so that the same pigment can vary from a warm brown to a blue grey, without admixture with any other colour but white, merely in accordance with the manipulation it receives. Yellow ochre gives similar results; when lightly brushed over a white ground it seems a rich orange, when brushed in precisely the same way over a black ground it seems a sort of green.

Similar effects are found with all pigments, they are warmer when laid thinly over a light ground, colder when laid thinly over a dark ground. Warm and cold, as applied to colour, meaning here, as elsewhere, nearer the red and nearer the violet ends of the spectrum respectively.

The explanation of these changes lies in the theory

of turbid media, a theory of great importance in painting, as, amongst other things, all aerial perspective depends upon it; but to this we shall return later on. We have seen that the waves of light vary very much in length, the red ones being the longest, the violet the shortest. Now one may observe any day on the seashore that when a big wave reaches a small obstacle it passes on almost unimpeded, but that this same obstacle can completely stop a little wave and reflect it back again. This is precisely what happens when any very small particles lie in the track of a beam of light. The big red waves pass on and the small blue ones are reflected back. In this way is the blue of the sky produced. The finest particles of dust, the microscopic germs and spores, that are always floating in the air with the tiny globules of water that are never wholly absent on the dryest days, are sufficient to reflect to the eye the smaller waves of light, while the larger pass onwards into space. The same agency turns the light of the sun blood-red when it is near the horizon, the long stratum of densely charged air being sufficient to stop and disperse all the rays except the very largest, *i.e.* the red and orange, which alone have sufficient energy to pass the minute obstacles that lie so thickly in their path. Such, at least, is the explanation given by Tyndall of the peculiar action of very small particles. It is true that other explanations have been given, but the fact that very small particles of any kind do only reflect the shorter rays while they transmit the longer ones is quite independent of any explanation.

I will treat of this again when I come to the question of aerial perspective; for the present it is enough

to give this rough indication of the action of minute particles, and to point out that this same process takes place on a small scale in our pigments. They consist of very fine particles connected by an oily fluid, and as such the peculiar properties of turbid media come into play and modify their own proper colours. For instance, ivory black is a substance which absorbs impartially all the rays of light, hardly reflecting any. If brushed thinly over a white ground so that the ground shows through, the light passes through the thin layer of black, reaches the white ground, and is reflected back again through the black to the eye. If it were not for the arrangement of the black paint in small particles, the light would be deprived equally of all its waves and the result would be neutral grey, but over and above the true absorption, caused by the molecular structure of the ivory black, there is a further absorption of the blue and violet waves, which are dispersed by the tiny lumps into which the paint has been separated by grinding, so that more of the big red and yellow rays get through from the white canvas beneath than of the little blue and violet ones; the result to the eye being a kind of brown. Again, when a neutral grey compound of ivory black and flake-white is lightly scumbled over a black ground the little particles allow the warmer rays to pass through to the black and there get absorbed, whereas the shorter ones are reflected back in all directions and some of them reach the eye; the result being the blue-grey tint to which we have already alluded. This, then, is the explanation of a fact of which artists are well aware, but which is often found very puzzling by beginners,

that a thin glaze of any pigment over a ground lighter than itself is warmer than the natural hue of the pigment, whereas a thin scumble of the same pigment over a ground darker than itself is colder than the natural hue. In the hands of the skilful painter this property of pigments can be made a help and not a hindrance, as in many cases it is much more convenient to obtain greys by painting lightly over a dark ground than by mixing a separate tint, and there are certain rich browns and reds which can hardly be obtained, except by painting thinly over a light ground. The painter who has all these effects at his fingers' ends may perhaps think that nothing is gained by knowing the rationale of them; but for a beginner, five minutes study of theory may prevent months of bungling. Of course no amount of theory can be of use without a great deal of practice, but the practice must be guided by some principle. It is only by long and laborious striving that a man can ever learn to be a painter, and certainly nothing that I or any one else can say can enable the student to dispense with this labour; but one thing can be done by precept, and this I have had steadily in view as the aim of this primer, that is, to enable the student to be, to a great extent, his own instructor, by giving him an intelligent appreciation of the causes of the difficulties that he has to overcome.

FURTHER TRAINING.

We will now return to the further training of the student. It is a rule adopted by sensible people in

every pursuit of life; that the best way to overcome difficulties is to begin with the easiest, and gradually to work up to the hardest; so in painting, the pupil should work for a long time at still life, *i.e.* things that remain unchanged for an indefinite time. Care should be taken that the lighting of the object be as uniform as possible—on no account should it be painted in direct sunlight, as that is continually in movement, and the work should be suspended during fogs, or any other great alteration of the lighting. This kind of study should be persevered in until a very close imitation of nature can be arrived at—there should be hardly any difference between the picture and the object when they are placed side by side and looked at from a distance, beyond a certain lack of brilliancy in the copy which is generally inevitable. When this result has been achieved the pupil knows what is good workmanship, and has a standard which will make him difficult to please when he proceeds to more trying subjects. He should now be promoted to working from the model, who can also be placed in a uniform light, but who unfortunately is never quite still, and generally permits himself considerable latitude of movement. His colour, too, is apt to vary from day to day according to his state of health or whether he is warm or cold. These fluctuations of course enormously increase the difficulty of accurate representation, and would be dangerous to a student who had not been trained to great correctness; as when anything looks wrong it is so easy to say to others, and even to believe oneself, that the model has moved, and that he was quite different half an hour ago. But there are great advantages in the

human figure over still life, in that it is so much more interesting, and also that it is so much better known, so that any glaring error strikes the eye at once even without reference to the original.

LANDSCAPE.

The student, even if he intends to devote himself to figure painting, should never neglect landscape; for his figures must have a background of some kind, and the time will surely come when he will feel dissatisfied with cottage interiors or tapestried halls, and will long for the green fields and the blue skies so that his puppets shall seem at last to get a breath of fresh air. But landscape study must not come too early, as it is impossible to avoid much greater variations of light and shade and colour than need be encountered in the studio. Again, the standard of accuracy is very lax, as people look at landscapes with much too heedless an eye to appreciate deviations from truth that would immediately strike them in a human figure. Trees have their laws of growth as much as men, but an error in drawing a tree equivalent to making a man ten heads in height, would be passed over by the most observant—which again at once suggests the necessity for the landscape painter of studying the human figure in order to acquire a proper standard of accuracy.

At first the simplest subjects should be chosen in landscape, and seen under the simplest aspects. Sunlight should be carefully avoided, as well as any transient

effect of cloud and storm. A bit of hedgerow or an old tree stump on a quiet grey day will afford excellent practice, and will if carefully painted reveal beauties that will astonish no one more than the painter—who has probably repressed with noble stoicism that love of panoramic views and sunset effects which is natural to the beginner. Of course the student need not always be kept at this comparatively easy level. Sunlight must not be permanently eschewed because it is difficult, and even very transient effects may be tried when the hand has acquired sufficient rapidity to more or less keep pace with them. It may be a question whether the memory may not be trained by teaching the pupil to paint by recollection, especially as there are some lovely effects that are so momentary that they cannot be rendered in any other way. I am afraid the answer must be that, however valuable such study may be to the trained artist, to the beginner it is too dangerous to be recommended. No work done in this way can equal the truthfulness of a direct transcript from nature, and so it would inevitably tend to diminish that high standard of accuracy that we have taken so much pains to build up.

AERIAL PERSPECTIVE.

There is a special difficulty belonging to landscape painting which hardly occurs at all in studio work, and which is consequently a great pitfall for even accomplished figure painters. Fortunately it is a difficulty that can be very essentially diminished by

a little theory, and is indeed a very favourable example of how much direct observation can be helped by knowledge. I refer to aerial perspective—a subject that I have already mentioned, and which I promised to go into with some fulness. Aerial perspective treats of the effect of distance on colours in the same way that ordinary perspective treats of the effect of distance on forms, and they are both needed more especially to correct certain natural tendencies in the mind to falsify the messages given it by the eye. We have already seen that when an object, such as the top of a table, is much foreshortened there is a natural tendency to draw it not as it actually appears, but according to the conception formed of it in the mind, and this tendency has to be counteracted by perspective. In the same way there is a natural tendency to represent a distant object not in the colours that it actually sends to the eye, but in the colours that it is known to assume when quite close, and which are always thought of as the proper colours of the object. For instance, the shadowed side of a tree on a distant hill side may be not green at all but pure blue-grey, but the inexperienced artist will inevitably paint it green, and will say that he sees it so; thus over-ruling the direct testimony of the eye by the conception formed by the brain. The chief business of aerial perspective in these cases is to substitute a correct conception for the false one, and thus enable the eye to deliver an unbiased message. It has another use, which is to aid the memory in the painting of transient effects, and to supply the necessary data in the rare cases when it is necessary to paint out of one's own head or from photographs.

Most people, including many painters, if asked what effect distance had on colours would say, "Oh, it makes them blue," quite regardless of the fact that they have never seen the sun blue in their lives, although being ninety-three millions of miles away it ought to be a favourable subject for the exercise of this property of distance.

Better informed people of course know that aerial perspective does not depend upon absolute distance but, as its name implies, upon the atmosphere that lies between the spectator and the object. The powerful light of the sun, it may be said, is not affected by the comparatively small extent of atmosphere that it traverses—that is why it is not blue. When the sun is very near the horizon, however, its light passes through a much longer and denser stratum of air than when it is high up, and its light then is certainly affected by the atmosphere—but does it seem blue? Every one knows, on the contrary, that the sun near the horizon looks redder than usual, sometimes even it assumes a deep blood red. So a little reflection is quite sufficient to show that the ordinary answer is quite inadequate. It is only partly untrue, for certainly distant mountains look blue enough, at least any part of them that is not brilliantly lighted up by direct sunlight. This latter qualification brings us to the true rule—*every shadow, every dark object of any kind, becomes lighter and bluer with distance, very light objects either remain unchanged or become warmer in colour.* Such is the law of aerial perspective stated in the roughest manner—and now for the explanation of our law. It is to be found in that theory of the colours of turbid media of which I have already given a slight

sketch. Very small particles of any kind whatever transmit unaltered the longer waves of light, whereas they reflect in all directions the shorter (blue and violet) ones. The atmosphere is a gigantic case of such a turbid medium; floating about in the air there are innumerable tiny particles of dust, organic and inorganic, together with minute globules or perhaps bladders of water. These disperse in all directions the smaller waves of light, leaving the larger ones to pursue their course. This dispersed light is therefore blue—a blue indeed that can reach a high degree of intensity when seen unmixed with any other light. Such is the blue of the sky, which is simply the light reflected from the tiny particles floating about in the air unmixed with any transmitted light, as there is nothing but the black of space behind them. We now see why the dark parts of a distant mountain look blue; being dark they transmit hardly any light to the eye, any feeble rays they may send being quite overpowered by the blue light that streams back to us from the dust and vapour-charged air in front of them. The amount of this blue light depends, firstly on the depth of the layer of air between the eye and the mountain—in other words, on the distance of the mountain; secondly, on the density with which this air is charged with particles; thirdly, on the size of the particles. If the particles are large they reflect all rays impartially, and instead of a blue veil in front of the mountain there will be a white one, as frequently happens in misty effects, owing to the large size of the globules of water. But if instead of a dark background there is a light one? There will then be light transmitted through the air and a precisely opposite effect

will take place,—the longer waves will pass through unimpeded, whilst the shorter ones will be stopped and dispersed.

There will thus be a sort of balance established between the light transmitted from the object, which will be warm, and the light reflected from the atmosphere in front of it, which will be cold. Under ordinary conditions this serves to keep light objects in the distance very much in their true colours; the shorter rays that are robbed from their light in its passage through the atmosphere being restored again by this very same atmosphere from the light that reaches it from other parts.

In the case of the sun near the horizon there can be no such balance, for the light transmitted from the sun is so much stronger than any light reflected from the atmosphere itself that the former quite overpowers the latter; so by far the greater part of the light that reaches the eye has been transmitted through long and very dense layers of air, and has in its passage been deprived of all except the longest visible rays—the reds and the oranges.

The colour then of distant objects is modified in two opposite directions. First of all, the light that comes from the object is more or less deprived of its blue rays, but then there is the intervening stratum of air which sends itself a blue light to the eye. If the light from the distant object is much stronger than that reflected from the intervening air, as may happen with self-luminous or with very highly illuminated bodies, then the colour of the object is warmer than when seen close. If, on the other hand, the light from the air is the strongest, as happens when there

is nothing but shadow or darkness behind it, then one gets the blue effect of distance. When the two lights are equally balanced the colour of the object remains unmodified.

This is roughly the theory of aerial perspective, one of immense importance to artists, but usually very imperfectly known by them. It is true that knowledge of the theory will never by itself enable the painter to represent aerial effects, but it can be of great value in directing the studies of the beginner, by giving a means of connecting together in one consistent whole the scattered observations that he makes on the effects observed in nature. And these effects are very difficult to observe, for, as we have already pointed out, there is an almost ineradicable tendency in the mind to see things not as they are at the moment but as they have usually appeared, so that objects in the distance are always clothed by the imagination with the colours that they wear in the foreground. It is only after years of training that what may be called the accidental, as distinguished from the usual, colours of objects can be fully recognised, and even then if the training has not been well directed it often fails of its effect.

PORTRAIT PAINTING.

There is a further study which I strongly recommend to every incipient painter, no matter in what direction his genius leads him; and that is the study of portraiture. It should not be undertaken too early, as amateur sitters are apt to be rather troublesome,

especially with a beginner for whose powers they have small respect, but for advanced students it cannot be surpassed as a means of training the eye to extreme accuracy. For in working from the model, as long as the study is well painted and looks like a human being, no one will inquire if it bears more than a superficial resemblance to the particular human being that it represents; whereas with a portrait the painter has to satisfy not only himself and his brother artists, who will probably judge of the work solely on its technical merits, but also the friends of the victim, who generally care not a farthing whether the picture be well painted, but who will have that minute accuracy which constitutes a "likeness." It is true that some caution must be exercised in taking the opinion even of those who know the sitter best, for the artist may have caught some look, some expression, the truth of which is so vividly recognised, that conspicuous faults in other directions are quite neglected. But this vivid recognition will probably be confined to one or another of the friends—the others will see the faults and remain blind to the truth of expression. But if the portrait is really good it will seem so to nearly every one—very often for different reasons—but they will all acknowledge the likeness. Of the same portrait one will say: he knows so well that sweet pensive expression, another is in raptures over the keen wide-awake look of the eyes, a third praises the stern mournful brow, a fourth, the look of genial good-humour that beams from the entire countenance, and so on. In fact, the picture represents the man, and they all read into it what they have been accustomed to see in the man himself. Such is the test of a really accurate likeness, and the

portrait that can stand this test has probably reached a higher standard of truth than any mere study from the model that the painter has produced. I must here guard myself against being supposed to say that this accuracy is the sole aim of portrait painting. I certainly think that the chief business of a portrait is to be like the person it represents; but this is not the only requirement. It is essential that whatever there is fine and noble in the person's character should be expressed, rather than what is mean and ignoble, as also that whatever is beautiful in form, colour, and expression should be jealously preserved. It is possible that this treatment may not give a perfectly fair abstract of the man's character, but the aim of the portrait painter is not that of the historian, he should wish to represent a person as he is seen by those who love him. He can only give one aspect of the man—let that be his best. This it is which constitutes the great difficulty of portrait painting, and it is far too great a difficulty for the student to encounter. In his portraits he should aim at accuracy and at nothing else. So shall he advance beyond the student stage.

I have said nothing about composition, for I fear for this no adequate rules can be given; indeed, the practical instruction of a master can help but little. All that can be said is that if the painter has a story to tell, he must so order his picture as to tell it clearly. But how is he to do it? As well ask how a novelist is to tell his story clearly. Again, the picture must not be a mere diagram, it must have pictorial qualities, that is, the arrangement of line and colour must be agreeable, or at least effective. About this there is

nothing to be said, except that there is some mysterious sense of symmetry which makes certain lines or certain colour combinations more pleasing than others, a sense with which the painter is presumably more gifted than other people—if he is not he had better leave composition alone. The sense can be perhaps educated by studying the works of the great masters, but certainly no definite rules can be derived from them, and any rules that have been so derived by the perverted ingenuity of writers on æsthetics are far more likely to be a hindrance than a help.

I think it is possible that in the future the laws of the harmony of colour and form may be laid down with some approach to accuracy, but all attempts in that direction have failed as yet. The artist must rely upon his taste, in the hope that he will meet with a corresponding, though less developed taste in the public for whom he paints.

IMITATION OF NATURE.

Thus far I have endeavoured to give some notion of the course of study that I believe will be most effective in mastering the technical difficulties of painting. In all student work the strictest and most literal imitation of nature must be aimed at, and the work must always be checked by the closest comparison with the object represented. The student must be incessantly asking himself the questions, "Is this like nature? If not, wherein does it differ from it?" And to these questions honestly asked,

it is seldom that no answer is found. When by this means the power has been gained of accurate representation, then, and not till then, may the imagination be called into play, may known elements be recombined into the unknown, may forms be ennobled and idealised, may ugliness be omitted and beauty enhanced, in short, may the higher qualities of the painter be exercised, in the full confidence that what the mind conceives, that will the hand be able to execute. So shall we be spared the sad alliance between lofty aims and childish performance, which has ruined so much of modern art.

There is an insidious objection which has often been urged to the literal representation of nature, viz., that such representation might be very valuable, only it is unfortunately impossible. The highest light of a picture is given by white paint, lit up by the small amount of light that is to be found on the wall of a room. How, it is asked, can the brilliancy of a sunlit sky be rendered by such poor means? The range of nature is infinite in comparison with the humble scale of light and shade at the disposal of the painter. He can only give suggestions of the glories of nature, anything like imitation is far beyond him. This sounds very well, and has done much mischief in its time, but a little reflection will show that it is not true. For undoubtedly a picture on the wall of an ordinary room can look very like a sunlit landscape, and a simple object lighted in an ordinary manner can be reproduced with a vigour that seems to fall very little, if at all, short of nature itself.

Yet the objection has some solid ground to rest upon. Undoubtedly the picture reflects much less light

to the eye than does the sunlit landscape. How is it that the eye is indifferent to this discrepancy?

We will take a strong case. Let us suppose[1] two landscapes hanging side by side, one representing a caravan in the desert under the full blaze of the mid-day sun; the other a moonlight scene.

The highest light of both will be rendered by the same pigment, viz., white; in the one case perhaps toned to a slightly yellow hue, in the other to a slightly blue one; and yet the scenes represented differ very much in luminosity. Indeed, this difference is enormously greater than is generally supposed, for sunlight is nearly a million times as bright as moonlight. These highest lights that have almost the same luminosity in the pictures, represent a difference of nearly a million-fold in nature. And yet they look right. The one looks like moonlight and the other like sunlight. How does the eye get over these discrepancies? The answer is suggested by the very astonishment with which we first hear that sunlight is a million times as bright as moonlight. The fact is that the eye pays hardly any attention to variations of total illumination—the relative illuminations of the different objects seen by it at one time being to it the important thing. These remain practically unchanged throughout great variations of the total light, variations to which the eye adapts itself very readily, and almost unconsciously.

There is an experiment which brings out this very clearly.

Figure 12 represents a circular piece of white paper

[1] This illustration, as also a good deal that follows, is borrowed from Helmholtz's lecture "Optisches über Malerei."

on which three black marks have been made. If this paper is made to rotate rapidly the black marks are apparently spread out until the appearance is presented of three grey rings on a white ground.

If the black marks are of the same size the inner rings are darker than the outer ones, as the proportion of white paper to black mark is greater in the latter case. This affords a very easy and exact means of producing very small variations of shadow. Now

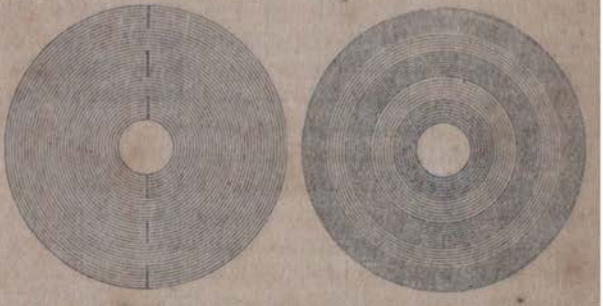

FIG. 11.

it has been found by direct experiments in this manner, that within any ordinary limits the total illumination of the white paper can be changed indefinitely with scarcely any influence on the visibility of these grey rings, that is, a ring of a grey so faint as to be just distinguishable from the white paper under a strong light remains neither more nor less distinguishable when the light is gradually diminished until the illumination is very faint. I have said under any ordinary limits, for if the light is extremely

strong or extremely weak, the grey would cease to be distinguishable.

Put into painter's language it comes to this; that there are as many visible gradations of light and shade with a weak light as with a strong one. Indeed, in very strong illumination as that of sunlight, there are fewer gradations seen than in any ordinary light. Although in sunlight the actual physical difference between the amount of light reflected by a white surface on which the sun shines directly, and a hole in the ground which is hardly lit up at all, is enormously greater than the difference between the highest light and the deepest shade of an ordinary room on a dull day, yet to the eye there will be more difference in the latter case than in the former. How is it that the eye takes so little account of variations of illumination? We will suppose a man going suddenly out of the daylight into a cellar lit up by a farthing dip. At first he sees nothing but the candle, the retina is insensible to the feeble reflections from the objects around; but in a little time the room appears to get lighter, objects shine out from the gloom, soon every detail is distinguished. The retina has become more sensitive. The man now goes out into the full sunlight. Everything appears lost in one blinding blaze of light—and no wonder, the deepest shades of the landscape are much brighter than the most strongly illuminated objects of the cellar. But soon the sensitiveness of the retina becomes blunted, and in a very short time the eye gets so accustomed to the sunlight, that it no longer appears particularly bright. The gigantic difference in illumination that was so keenly felt at first has almost disappeared.

This then is the explanation of our difficulty with the two pictures. It is true that the painting of the sunlit scene falls far short of the reality in actual intensity, but then the eye that looks at the picture has not been blunted by long exposure to a powerful light, so the luminous impression can be almost as strong in the one case as in the other. Again, the moonlight picture is many times brighter than the scene it represents, but the picture is not looked at by an eye in that extreme state of sensitiveness which the dim light of the actual landscape would produce. So here again, the luminous effect is not so very different. What the eye does see with extreme distinctness, are the relative intensities of different lights and shades at any one moment, and these the painter can render with great fidelity.

Although, as I have said, it is very possible to make a moderately illuminated canvas represent very faithfully a highly illuminated scene, yet there are certain special difficulties in the way which are very well worthy of consideration. In the first place the painter is sure to see too much. The scene has to be represented as it strikes the spectator in its entirety, but the painter loses this general view as he dwells on each separate part. We will suppose that he is painting a bit of shadow in the midst of a sunlit landscape. Before he has looked at the shadow five minutes, his eye will have completely recovered from the deadening glare of the sunlight, and will see every little variety of light and shade, every tiny detail in the shadow, which it was quite unable to distinguish when looking at the general landscape. If the painter puts this all in, he will inevitably destroy the effect of his picture.

"But he sees it," it may be said; "why should he not paint it?" The answer is, that he does not see it until he has refreshed his eye by looking at that particular spot for some minutes; which is certainly not the way to take in the effect of the landscape as a whole. Again, we will take some bit that stands out brighter than all the rest, say a white stone with the sun upon it. When looked at as a part of the whole scene, this seems a mere white mass, all the minor markings being lost in the general glare of its whiteness. But when the artist comes to paint it, he looks at it until his eye has become accustomed to its brightness, and the little markings soon stand out dark and distinct, and the general whiteness turns into all sorts of greys and yellows and pinks, all very beautiful if one were painting a stone and nothing else, but quite incompatible with the general effect of the stone as the brightest object in the landscape.

To put the matter in a more general form, the painter's tendency, as he paints each separate part, is to exaggerate the local differences of light and shade, and to over-accentuate the local details at the expense of the general effect, and this tendency is not caused by mere error of judgment, but is an actual consequence of the structure of the eye. He actually sees these things, and has to carefully learn not to paint them.

Of course, if the illumination of his picture was the same as that of the landscape, these difficulties would not arise. He might paint all the detail he liked in his deepest shadow and in his highest light, the spectator would not see them in his picture any more than he does in the actual landscape. It would be rather a waste of time, but otherwise it would not matter.

There is a similar difficulty arising out of the contrast of colours to which I have already alluded. Under high illumination all colours are much modified by contrast, a modification that almost disappears under diminished illumination. As the painter looks at each patch of colour separately when he is painting, they lose the benefit of this modification, and are seen very much in their true tones. If he reproduces these in his picture, his colours seen by the dull light of an ordinary room are quite inadequate to call up the contrast effects that so profoundly influenced the apparent hues of the real landscape. This, again, is a difficulty that has to be overcome.

There is another trouble that besets the landscape painter who chooses bright days for his work. When he brings his picture indoors it is apt to look much colder and greyer than it did out of doors.

The explanation of this is very curious. By diminished illumination the different colours get darker in very different degrees—red is the first to turn black, then orange, then yellow, and so on through the spectrum; whilst blue and violet remain visible in a light that is insufficient to show any of the other colours. There is a very simple experiment which shows this with great clearness; paint two little strips of paper, one red and the other blue, so that in a moderate light they look about the same degree of brightness; now take them into full sunlight, the red looks much the brightest; on the other hand take them into a dark corner of the room, the blue is much brighter than the red. To explain these effects we have only to suppose that the three nerve elements are not equally sensitive under different degrees of

illumination, the red seeing-nerves suffering most from any diminution of the light, then the green, and least of all the violet.

The practical result of this is, that a strong illumination brings out the warm colours of objects, whilst a weak one gives the preponderance to the cold colours.

This is the reason why moonlight appears bluish—it is merely a weakened sunlight, but so weak is it, that hardly any colour but blue can be seen by it at all. Sunlight again is warm because it brings out in such strength all the warm tones of nature.

Now to apply this to our picture. Even under the shade of an umbrella, it has received much more light than when seen within the walls of a room. So out of doors the yellows and reds were prominent, whereas indoors the blue gained the upper hand. The whole effect being that the picture has lost its warmth by reason of the diminished illumination.

NECESSARY DISCREPANCIES.

The question now arises whether there are any necessary discrepancies between the picture and the scene that it represents. There is certainly one, but that is not a very important one. It is well known that our perception of distance depends a good deal on the fact that we have two eyes—each eye sees a slightly different view of the object before it, the difference being greater in proportion as the objects are nearer; that is the brain receives two very different images of an object that is close, whereas the image of

a distant object is practically identical for the two eyes. Again, when the eyes are made to converge on an object in the foreground, objects in the distance appear double and *vice versâ*.

It is a curious instance of the way we take hold of the practical results of our sensations while ignoring the means by which we arrive at these results, that although we all see these double images, very few of us are at all aware of their existence. Indeed, there are many people who can only with great difficulty be taught to perceive what in fact they have been seeing all their lives.

The simplest way of perceiving this double vision is to place a candle at some little distance off, say six feet, and then to hold up one finger straight in front of the flame. If the finger is looked at two flames will be seen; if the flame is looked at there will be seen a finger on each side of it.

Now there is no means of reproducing in a picture these peculiarities in the appearance of real objects. In a picture objects in the foreground do not appear double when the distance is looked at, nor do they present any difference of aspect to the two eyes.

When I say there is no means, that is not quite accurate, for there exists an instrument, the stereoscope, by which flat pictures can be made to present these very peculiarities of real objects. Two photographs are taken in slightly different positions corresponding to the two different images made by the two eyes. These when combined by appropriate lenses produce an extraordinary impression of solidity, which gives by its very intensity, a measure of the loss that a picture undergoes by not being able to reproduce

these appearances. This will explain why a large picture seen some way off looks much more real than a small picture seen close, for the images in the two eyes are practically identical for objects at any distance; so the further off is the picture the less becomes the necessary discrepancy between it and a real scene. It will also explain the increased appearance of reality that a picture presents when looked at with only one eye.

There is another difference between the picture and the scene to which I will only allude, as no spectator need be troubled by it if he does not wish it. When one moves about all the objects in a scene assume different apparent positions with regard to one another. The distance seems to move with the spectator, whilst the foreground moves in a contrary direction. This can be best observed in a railway train, where the hedges on each side seem to be rushing past the train while the distant mountains are moving with it. Of course the effect is not nearly so marked when a man simply moves his head, but still it is there all the same. Now this again cannot be given in a picture. If one moves about in front of it, the picture can be foreshortened as a whole, but everything in it keeps its relative position.

This will perhaps explain that very simple mystery which has long shed a halo round the craft of the portrait-painter. It is frequently remarked as a proof of the lifelike character of a portrait that the eyes follow the spectator about a room—a result due, it is supposed, to some superhuman skill on the part of the artist. As a matter of fact, if the eyes of a portrait look straight at one in any one position, they cannot help

doing it in every other. He would indeed be a skilful painter who could give on a flat surface two different views of the same face. It is odd that no one expects a full face in a picture to change into a side face when he moves his position, but he does expect a precisely similar change in the matter of eyes, and is astonished at the skill of the artist when it does not take place.

I have now given the chief reasons why the eye is hardly ever deceived by a picture, and they are certainly far more important in this respect than any difference of intensity as regards light or colour. But I by no means think it desirable that a picture should deceive the eye; were it to do so, one of the elements of pleasure and interest with which we regard it would be wanting. A good picture pleases us not only by the beauty of its form and colour, and by the interest of the scene it depicts, but also by the consciousness that we have of the human skill that has gone to make it. We take a pride in it, in that it is the work of a man like ourselves.

But the impossibility of actual illusion does not much affect my view of the great closeness with which a painting can imitate nature. In all essential points the appearance of objects can be rendered with a truthfulness that leaves little to be desired —a truthfulness that is not at all affected by the little discrepancies in minor points which, although unimportant in themselves, are sufficient to remind us that it is a picture and not nature that we are looking at.

It is as if we looked at a beautiful scene in a mirror. The smallest crack in the glass would be sufficient to tell us at once that it was a reflection and not a reality

that we beheld, but the scene would lose none of its beauty or its truthfulness on account of this.

I believe there are no other necessary discrepancies than the ones I have mentioned between pictures and the reality that they profess to represent, so the student may go on with his pursuit of truth undeterred by the thought that it must necessarily be a vain one.

And when all is said and done, when the student has laboriously conquered all the technical difficulties that beset his path, and has at last acquired the power of giving a faithful transcript of nature, it will perhaps be scornfully asked, "What has he gained after all? He has become at the best a superior kind of photographer, but he is certainly unworthy of the name of artist. Where is the imagination, where is the poetry, where are the finer feelings that alone make art valuable?" To which I reply, firstly, that a superior photographer is a very useful and admirable person. That even an inferior photographer can make us acquainted with the beauty of the world we live in, and that is a work of which any man may be proud. Much better indeed than the work done by a painter like Fuseli, who mistook the dreams caused by a disordered digestion for the promptings of the imagination. A mistake that I fancy has not been uncommon in the history of art.

Secondly, the highest artistic imagination is useless without the means of expressing it, much in the same way that a poet must acquire a mastery over language before the world can benefit by his poetry. But it may be said that a mastery over painting is not the same thing as a power of truthfully depicting natural objects. If it is not, it is difficult to say what it is.

Suppose I want to depict the witches in Macbeth. This is certainly a scene that will require some imagination on the part of the artist. At the same time I must make the witches look more or less like women, or nobody will know what they are meant for. In the same way the cauldron must look like a cauldron, and the fire must look like a fire, and must throw a proper firelight glow upon the witches and their surroundings, and even the spectral baby must look like a baby, whilst there is no doubt that Macbeth must look like a man. So the painting of this highly imaginative scene necessitates a power of representing men, women, and babies, together with fires, cauldrons, and other matters, such as nothing but close and truthful study will ever confer even upon the most gifted artist.

But supposing he has this power, will he be able to represent properly this highly poetical scene? Very likely not, but he most certainly will not be able to do so if he has not this power. If he can represent nature truthfully but has no imagination he will not be able to paint Macbeth, but there are many other things that he can paint and which are well worth doing; whereas if he has imagination and no technical skill he can neither paint Macbeth nor anything else.

There are two sides to painting, one is the strictly technical side, and demands such qualities as good workmanship and careful and intelligent observation. The other may be called the artistic side, and demands good taste, a feeling for beauty, and in its highest aspects poetry and imagination. There has, unfortunately, grown up a sort of feeling that the two are in some way antagonistic; and it will certainly be

held by a great many people that the course of study that I have recommended in this primer will have the effect of destroying the higher qualities of the artist, and reducing him to a mere mechanical drudge. When plainly stated, this view is so absurd that it is unnecessary to argue against it. The imagination has to express itself somehow, and the more mastery the painter has over the means of expression the less trammelled will be his imagination. But the misfortune of artistic literature is that nothing is ever stated plainly in it. It always reminds me of the old metaphysical discussions in which nothing was ever proved, except the great ingenuity of the people who took part in them.

It is partly in the hope that by beginning in a more humble way it will be possible to find firm ground at last for artistic discussions that I have written this primer. I am aware that it leaves the most momentous questions of art untouched. I have said nothing about imagination, except that I am aware of its existence and even of its extreme importance—but then, no one can teach imagination, and it is possible to teach perspective. Even the questions of harmony of line and colour, which lie at the root of all art, I have left untouched, not because they are unimportant, but because not enough is known about them to make their discussion in the least profitable.

On the other hand the subjects on which I have touched are most of them capable of very definite statement, and even where our knowledge of them is uncertain it is so only on account of the inadequate investigation that these questions have received, and will no doubt be rendered fuller and surer year by

year; whilst even if opinions may differ as to their practical value to the student of art, few will deny that they are at least worthy of his attention and interest. For my own part, I believe firmly that the feeble and tentative work that is the reproach of modern art is, to a great extent, owing to want of knowledge.

Of course I do not pretend for an instant that this little work can do much to supply this want. All that I have endeavoured to do is to point out the sort of knowledge that is useful to art, and the manner in which it can be practically applied.

THE END.

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